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Introduction: TASC and BTS are pleased to submit our comments in response to the Department of Commerce National Telecommunications and Information Administration Docket No**:** 121031596-2596-01 RIN: 0660-XC003 (Development of the Nationwide Interoperable Public Safety Broadband Network) whereby The National Telecommunications and Information Administration (NTIA) issued a Notice of Inquiry (NOI) on September 28, 2012, seeking public comment on two conceptual presentations made at the inaugural Board meeting of the First Responder Network Authority (FirstNet) as well as to invite input on other network design and business plan considerations.

The following comments are being jointly presented by TASC and BTS (Battlefield Telecommunications Systems, LLC.)

About TASC: Founded in 1966 as The Analytical Sciences Corporate, today TASC provides a wide range of services to the Intelligence Community, Department of Defense and civilian agencies of the federal government. These services include systems engineering and technical assistance (SETA), Independent Verification and Validation (IV&V), Operational Test and Evaluation (OT&E), Developmental Test and Evaluation (DOT&E), wireless systems engineering and deployment services (licensed and unlicensed variants), Systems engineering and integration (SE&I), telecommunications architecture services, financial management services, business process management and analytical decision-support services. TASC leverages subject-matter expertise, CMMI Level 5 process-driven approach and unparalleled technical capabilities to develop innovative solutions to complex problems. These solutions help customers strengthen security and safety and protect the basic values of our society.

About BTS: Founded in 2008, Battlefield Telecommunications Systems core competency is enabling the deployment of cutting edge commercial communications technologies and infrastructure into any environment. BTS' goal is to create and implement architecture for advanced communications systems and leading-edge software applications to empower innovation and revolutionize information management solutions. BTS is focused on cutting edge 3G and 4G cellular technologies for federal and commercial customers to communicate with efficacy in harsh operating environments. BTS specializes in the development of complete, self-contained IP-based cellular systems, secure mobile wireless survey devices, and web-based collaborative link analysis visualization software tools, tailored each to meet the clients' unique mission requirements.

Network Design Considerations:

The following will highlight key systems engineering considerations for the FirstNet National Network

- **SETA:** Systems Engineering and Technical Assistance will be a critical element to insure an effective design is delivered to meet requirements. Key requirements include operational availability (Ao) system analysis through network modeling and simulation, design for multilevel priority services, ensure rerouting efficiencies around failed portions of the network (reference slide 11 of FirstNet National Network presentation from the Sept First Inaugural Board meeting), design for soft handoff to service provider public networks, network latency

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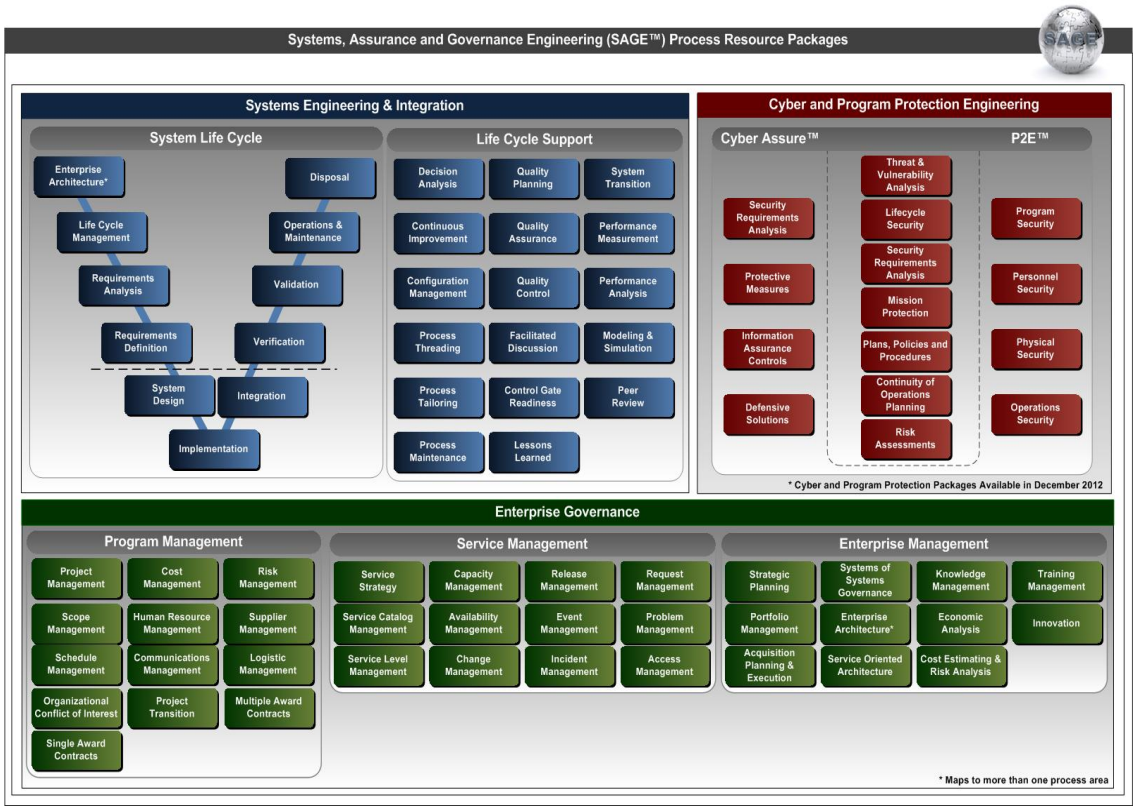
analysis, RF Coverage maps and associated link budget analysis, shared tower infrastructure study leveraging Customs and Border Protection CBP and Service Providers established footprints, design for interoperability, open architecture, and network extensions supporting Tactical LTE radios, with a fully distributed core operating in a Mobile Ad Hoc Networking (MANET) fully meshed configuration.

- **Systems Assurance and Governance Engineering (SAGE) Figure 1.**
  This diagram below depicts the SAGE **process.** The Sage process when implemented will benefit the FirstNet National Network through a comprehensive, integrated set of processes and tools that will enable FirstNet to reduce risks associated with deployment and turn up via an industry leading engineering implementation in providing advanced systems engineering, integration and services.

  The SAGE process suite draws on industry-accepted best practices to provide a process framework that focus on three core service areas:

  1. Enterprise Governance
  2. Systems Engineering and Integration
  3. Cyber and Program Protection Engineering

- Figure 1



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- **Leverage All Available Networks:** In an effort to meet public safety requirements for mission critical voice and data, it is critical that all available network technologies are utilized (see slide 8 of FirstNet FNN presentation); from a diverse nationwide network with multiple commercial wireless networks and systems (Network Option 3) to the use of standalone and rapidly deployable networks (Option 1). Recent advances in rapidly deployable LTE cellular technology allow cost effective implementation of cellular infrastructure for rural and urban areas. Applications for this technology include resilient 4G LTE mobile broadband connectivity dedicated exclusively to FNN users in both urban and rural areas that can be deployed and maintained at a fraction of the cost of traditional cellular deployments. As an extension of the standalone network, rapidly deployable mobile LTE data networks allow for on-demand extension of the FNN to remote areas and to quickly deploy redundant coverage in the event that commercial networks are down or not available.

- **Decentralized Network Design:** A critical design element of a FNN only LTE network is implementation of a fault tolerant, resilient LTE core network architecture that hosts many of the functions of the core network at LTE endpoints rather than at a centralized core at a mobile switching center. With many similarities to the decentralized and fault tolerant architecture of the Internet, this architecture provides superior LTE performance in the event of natural disaster with the ability to provide local connectivity and route data around network outages that is impossible with a traditional core network design.

- **Network As A Service:** Even with capabilities such as guaranteed quality of service and on-demand coverage provided by a rapidly deployable standalone network, the cost of deploying P25 networks and extending commercial networks has not been cost effective. The introduction of LTE rapidly deployable networks an FNN owned spectrum opens the doors for new business models, such as on-demand and per-subscriber models allowing the FNN to provide LTE connectivity and infrastructure where and when it is required while minimizing risk of high infrastructure

- **OT&E/DOT&E**: Operational and Developmental Test and Evaluation services will remain paramount through the pre-deployment and deployment phase of the network. TASC delivers comprehensive and interoperable testing through the following capabilities: defining test requirements, developmental testing, operational testing, interoperability testing, information assurance and cyber testing, standards conformance testing, and independent verification and validation (IV&V). TASC demonstrates strong adherence to these testing rigors through its Joint Interoperability Test Center (JITC) test lab. In sum, the TASC and BTS team can provide responsive, agile, and cost-effective testing services that will reduce risk in schedule, minimize costs, and streamline capabilities development, acquisition, and deployment/operations**.**
- **Legacy Systems Support:** It is critical existing Land Mobile Radio P25 systems can interoperate with the new LTE implementation of the FirstNet National Network. Herein please find some consideration for Legacy Systems Support

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- **Mobile Device Application Development Considerations:**
  Mobile applications development should take an automated view on developing cutting edge mobile solutions. The first and foremost guiding principle is to develop apps that are stable, robust, resilient to user induced failure, and a pleasure to use. A successful development environment should consist many years of experience working in automating the full project lifecycle from starting a new project to closing out the final code. Successful projects must be started using automation tools that ensure that the code repositories, build engines, and test systems are in place, as well as slots in the internal app store. It is this attention to detail and sensor engineering guidance that sets our successful implementation apart from others. In the area of first responder systems, application reliability that starts at the first line of code is paramount.

Business Operations Comments:

- **Financial management:** Comprehensive financial management will be key to ensuring budget planning; allocation and execution are performed in a timely and effective manner for both technical and business assets and services. This will be an important consideration as part of an overall acquisition and risk management strategy. Part of the financial management process can be the execution of a return on investment analysis to address the service providers' business case based on an extended subscriber base consisting of National Federal, State, Local and tribal user community.
- **Program Management:** Integrated program management also will ensure technical and business processes are implemented in a phased, integrated manner to reduce overall program risk and deliver effective capabilities on time, within cost and schedule that meet or exceed key performance parameters.

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